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SCHEDULE OF MEETINGS

12-17 March	**Regional Advisory Group on Water Standards, Regional Office for Europe, Geneva**
19-24 March	**Committee on International Quarantine, third session, Geneva**
16-25 April	**Seminar on the Public Health Laboratory Aspects of Virus and Rickettsial Diseases, Madrid**
22-28 April	**PASB/WHO Seminar on the Teaching of Preventive Medicine, Mexico**
26 April-3 May	**Expert Committee on the International Pharmacopoeia, fourteenth session, Geneva**

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MALARIA CONTROL IN AFRICA

Second African Malaria Conference

Considerable progress has been made during the last five years in the fight against malaria in Africa; but, while results so far achieved are indeed encouraging, there is need for an intensification of work both in the laboratory and in the field, in order that answers may be found to the many problems which are still outstanding. This was, in general terms, the opinion expressed by the 55 experts who participated in the Second African Malaria Conference, held in Lagos, Nigeria, from 28 November to 6 December 1955, under the auspices of the WHO Regional Office for Africa.

It was just five years since the first conference on malaria in Africa, known as the Malaria Conference in Equatorial Africa, had been held in Kampala, Uganda. The earlier conference recommended to governments responsible for the administration of African territories that " whatever the original degree of endemicity, malaria should be controlled by modern methods, as soon as feasible and without awaiting the outcome of further experiments ".[1] The second conference was called upon to review progress and to lay down the lines of future policy.

In working towards its central theme, namely, future antimalaria policy in Africa, the conference participants discussed the various aspects of such basic subjects as the epidemiology of human malaria in Africa; malaria parasites and their vectors; the present status of, and special problems arising in, the control of malaria in Africa; the chemotherapy of malaria; research on malaria and its co-ordination in Africa; and the training of malaria workers of all categories.

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1951, **38**, 46

The report of the conference, which was approved by the participants, forms the basis of what follows.

Epidemiology

Questions regarding the effects of malaria in Africa in pregnancy, in childhood, and in the adult have long been the subject of much conjecture; and, while reports of recent investigations throw light on some of these questions, much more information is needed, and the intensification of studies in different parts of Africa is urgently required. Particularly needed is information on the exact effects of malaria on the economic and social life of the African Region, which are still virtually unknown. There is, however, no doubt that even in holoendemic areas malaria has adverse effects, on all age groups, which constitute a barrier to the socio-economic development of African territories; so gaps in our present knowledge should not prevent or slow down the extension of malaria control.

Further experience has shown that the classification of malaria endemicity proposed by the 1950 conference requires some elaboration if it is to fit African conditions. This is particularly so with regard to the interpretation of the spleen-rate in children in the age group 2 to 10 years, for the value of this overall index varies with the age composition of the group.

A new concept of considerable interest is that of *stability* in African malaria. This is a state in which the immunity mechanism, and perhaps other factors, level out the effect on the human population of the enormous variations in transmission which are observed.

Vectors

The most important vector, and one which is found throughout the region, is *Anopheles gambiae*. This anopheline shows the most amazing variations of behaviour in different parts of Africa with regard to its resting and feeding, and even its breeding habits. These variations need clarification, and investigations of the problem by means of all modern methods must be multiplied and intensified. The assistance of WHO is required in making material and facilities available for the laboratory study of anopheline feeding habits.

Control problems

In Africa some of the obstacles to control are inherent in the nature of the continent, its development, economic conditions, and the state of administration and communications. Others lie in the extremely high endemicity of malaria commonly encountered and the length of the transmission season, which, if not peculiar to Africa, are rarely matched elsewhere. In addition, there are a number of technical problems which are shared with most other countries practising control, but made more important in Africa by the greater efficiency needed to control the high endemicity of malaria encountered there. These problems include the neutralization of the effect of insecticides by interaction with the materials of wall surfaces or through the influence of smoke, the uncertainty regarding the degree of efficiency and the period of persistence of different insecticides and their variations with dosages either on standard wall surfaces or on those encountered locally, and the uncertainty about the extent to which the main vectors rest and bite outdoors and the relationship of such outdoor habits to the efficacy of insecticides in their destruction.

In one area of Northern Nigeria, where three half-yearly applications of dieldrin have been made, two at 25 mg per square foot and one at 50 mg per square foot, *A. gambiae* has recently shown a physiological resistance to dieldrin and is present in appreciable numbers in treated areas. However, there has been no reason to suspect such resistance to insecticides elsewhere in Africa despite the extensive use of DDT and BHC for long periods. In one case it has been shown by laboratory test that no reduction of susceptibility has occurred in *A. gambiae* after seven years' wide use of DDT. There are also a few schemes in which dieldrin has been used for periods of two or three years where satisfactory control has been gained and where there has been no suspicion of any development of resistance to this insecticide.

While the physical, economic, and developmental difficulties in Africa, combined with the common high endemicity and prolonged transmission season, justify the temporary exclusion of Africa south of the Sahara from the general proposals on the eradication of malaria made by the Eighth World Health Assembly, there is ample reason to believe that control can be rapidly extended to great areas of territory, aiming at and, in some cases, soon reaching national (country-wide) protection. In the subtropical and other areas where endemicity is less than in the equatorial belt, such schemes are possible on the basis of existing knowledge, but could be refined and made more economical if they were associated with research. In the equatorial areas of extreme endemicity, schemes must be closely accompanied by entomological and epidemiological studies, together with local evaluations of the efficacy of insecticides and of the susceptibility of the insect to them. There is no reason why such schemes should await the results of special researches. These can and should be carried out in parallel with executive work.

The occurrence of an example of resistance, mentioned above, is a grave warning, but should be taken in association with the evidence of the wide, prolonged, and successful use of insecticides in other areas in Africa

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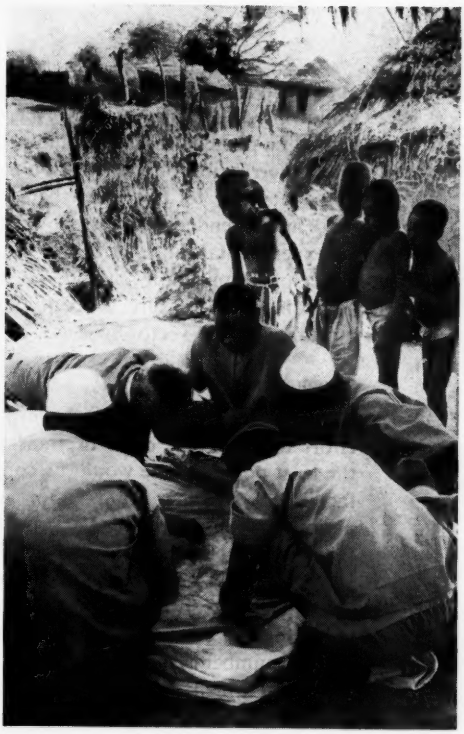

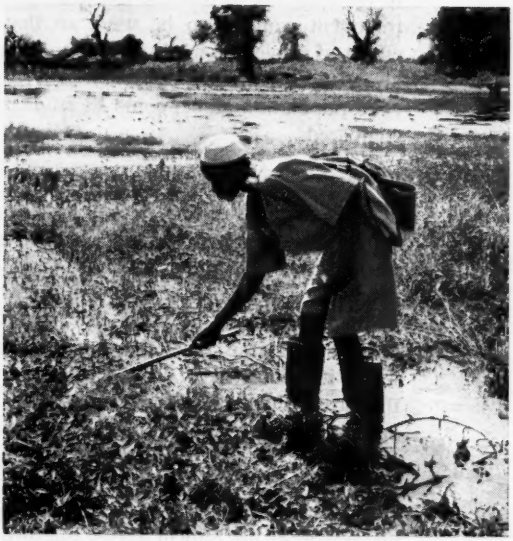

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1. *Typical village houses in rural Liberia, where a large-scale pilot project is under way*
2. *Spraying of residual insecticides inside a village house in Senegal. Notice the rough mud wall and the palm-leaf roof.*
3. *Estimations of anopheline density. Here the entomological staff of the Western Sokoto Pilot Project collects mosquitos from a sheet removed from the floor of a hut sprayed with a special, quick-acting, knock-down insecticide.*
4. *Checking on typical potential breeding places of* A. gambiae, *the important vector in Africa*

apparently without any such occurrence. Following this warning, however, schemes should be planned so as to obtain a complete local interruption of transmission as soon as possible; and, to this end, the insecticides used in holoendemic areas should be tested in experimental huts, and the dosage and cycle of application should be regulated accordingly to ensure a continuous high mortality of the vector species.

Chemotherapeutics

There is good reason to believe that the effort to break the cycle of transmission in the least possible time would be considerably facilitated by the combination of short periods of insecticidal attack with simultaneous short mass treatment of the population. Such a combined attack might well effect a saving in both time and money in achieving the cessation of malaria transmission. A number of pilot projects are therefore envisaged which should cover areas of adequate size and population where, in addition to the spraying of residual insecticides, mass treatment would also be used, so that the effects of single and multiple dose treatments, given to the whole population and to the child population alone, could be studied and compared.

Research

There is undoubtedly urgent need for an expansion of applied research, both in association with executive schemes and independent of them, in Africa and elsewhere. Most immediate attention is needed to problems of resistance, the mechanisms by which it is most likely to be stimulated, and the possibilities of its continuation or disappearance following the discontinuation of insecticidal attack. It is essential that WHO should continue and increase its efforts to ensure integration of executive and applied research work not only in Africa, but throughout the world.

Training

To meet the requirements of the expanding malaria-control programmes in Africa, facilities for the training of professional and auxiliary personnel will need to be increased. WHO has already played a considerable part in providing such facilities. Its assistance will be required even more in the future in the granting of fellowships, the arrangement of special courses in malariology, the provision of grants for individual or group study in specific aspects of malaria research, the exchange of personnel at all levels between projects in different countries, the organization of seminars for refresher courses and for the exchange of knowledge, and the sending of consultant malariologists from other territories to visit control projects.

Future policy

Of the 166 million people reputed to be living in malarious conditions in Africa south of the Sahara, some 14 million are said to be protected against malaria by one means or another, 9 million being protected by schemes using residual insecticides. It will be seen that 102 million still remain unprotected.

Extension of control measures to rural areas is by no means uniform. There are several territories with large populations in malarious areas where such extension is negligible; other schemes approach a national scale. While there are numerous schemes in which malaria has been reduced to a negligible level by residual insecticides, including areas in the holoendemic equatorial belt, there are no countries on the African mainland where elimination has been finally achieved. In Swaziland, Southern Rhodesia, and Madagascar, however, interruption of transmission has either already taken place or is envisaged in the immediate future. In some other countries, the degree of control has been incomplete, with a reduction of malaria, though not to a negligible level.

Both completely and partially successful schemes have resulted in a marked reduction in mortality, especially in children; and associated benefits, in such forms as a reduction of malarial load on the curative medical services, have permitted expansion of activities in other desirable directions.

Thus it may be stated that, although there are difficulties, uncertainties, and problems which make malaria control harder to attain in Africa than elsewhere, in places where control has been attempted these difficulties have not prevented the attainment of at least a marked improvement in conditions. There is therefore no doubt that malaria control should be extended as rapidly as is possible to both rural and urban populations in the malarious parts of all African territories.

MALARIA CONFERENCE *

Belgrade, 12-14 December 1955

A conference on malaria was held from 12 to 14 December 1955 in Belgrade, under the joint auspices of the Yugoslav Government and the Regional Office for Europe of the World Health Organization. Representatives from the following countries participated: Albania, Bulgaria, Greece, Romania, Turkey, and Yugoslavia.[1] Professor Č. Simič was unanimously elected Chairman of the conference.

* This article represents, with some modifications in presentation, the report on this conference as prepared by a drafting committee composed of Dr D. Dimtschev, Dr G. D. Georgopoulos, Dr G. Lupascu, Dr C. Pistoli, Dr M. K. Olcar, and Dr B. Richter.

[1] The participants were: Dr C. Pistoli, Vice-Minister of Public Health, Tirana, Albania; Dr A. Ashta, Chief of the Malaria Section, Ministry of Public Health, Tirana, Albania; Dr D. Dimtschev, Director, Institute of Parasitology, Sofia, Bulgaria; Dr G. Stantschev, Department Chief in the Ministry of National Health and Social Welfare, Sofia, Bulgaria; Dr G. Alivizatos, Professor of Hygiene, Faculty of Medecine, Athens, Greece; Dr G. D. Georgopoulos, Director of the Malaria Service, Ministry of Social Welfare, Athens, Greece; Professor M. Ciuca, Director of the Institute of Medical Parasitology, Bucharest, Romania; Dr G. Lupascu, Assistant Director, Institute of Medical Parasitology, Bucharest, Romania; Dr E. Ungureanu, Professor of Parasitology, Faculty of Medecine, Iasi, Romania; Dr I. Spinu, Director, Control of Epidemics, Ministry of Health, Bucharest, Romania; Dr M. Maurer, Director of the Institu e of Occupational Evaluation and Re-adaptation, Buchare.t, Romania; Dr M. K. Olcar, Director of the School of Hygiene, Ankara, Turkey; Dr M. S. Ögen, Director-General of Malaria Control, Ministry of Health and Social Welfare, Ankara, Turkey; Dr Č. Simič, Professor of Parasitology, Belgrade, Yugoslavia; Dr B. Richter, Parasitologist, Central Institute of Hygiene, Zagreb, Yugoslavia; Dr I. Grujić, Chief of the Malaria-Control Service of Bosnia-Herzegovina, Sarajevo, Yugoslavia; Dr M. T. Lepeš, Chief of the Department of Parasitology, Military Medical Academy, Belgrade, Yugoslavia.

The WHO Secretariat was represented by Dr W. M. Bonne, Director, Division of Communicable-Disease Services; Dr E. J. Pampana, Chief, Malaria Section; and Mr R. Pavanello, Regional Officer for Environmental Sanitation, Regional Office for Europe.

Malaria control in South-East Europe

As an opening to the technical discussions, the delegations reviewed the history of malaria control and the present situation in their respective countries.

The six neighbouring countries represented at the conference have certain malarial phenomena in common. Thus, in all of them, the three principal species of *Plasmodium* have existed; seasonal malaria has been an important factor in morbidity and mortality, and equally important in causing social and economic deterioration; and, with a few exceptions, the same vectors (*A. sacharovi* (*elutus*), *A. maculipennis*, and *A. superpictus*) are to be found in each country.

All the health administrations made efforts between the two world wars to organize malaria-control campaigns of varying intensity, which, however, were only partially successful and did not make it possible to envisage their extension on a country-wide basis. Only after the introduction of DDT were governments finally able to establish national control programmes. Between 1946 and 1950, the use of DDT became the method of choice in all these countries (Greece and Turkey, 1946; Albania and Yugoslavia, 1947; Romania, 1949; Bulgaria, 1950); and,

as was to be expected, the results were spectacular.

The conference participants furnished data on morbidity before the use of residual DDT and during the past few years. In Albania up to 1933, and in Bulgaria up to 1930, there were about half a million cases of malaria annually, whereas in the first ten months of 1955 only 1221 haematologically confirmed cases were observed in Albania and only 662 in Bulgaria. In Greece, where in some years the notified cases formerly numbered 1 200 000, only 408 haematologically confirmed cases were observed in 1952. In Romania, the 1948 figure for cases of malaria was 338 198; but in the first ten months of 1955 only 325 cases were notified (215 haematologically confirmed). In Turkey, the percentage of hospitalizations due to malaria, which was 8.6 in 1940, dropped in 1954 to 0.6. In Yugoslavia there were approximately a million cases of malaria in 1935, but the figure had fallen to 796 in 1953. In other words, in these six countries of south-east Europe, malaria, which before the first DDT spraying operations claimed 4 to 5 million victims per year, now attacks only a few thousand and would appear to be responsible for very few deaths.

All the delegations stated that their governments wished to take steps for the final eradication of malaria before the anopheles could develop any possible resistance to insecticides, such as had already been noted in Greece and elsewhere.

Control methods

The residual insecticides used by the various countries have been as follows: DDT in a dosage of 2 g per m^2, in kerosene solution or in emulsion; BHC in a dosage of 0.25-0.30 g of gamma isomer per m^2; more recently, in Greece, chlordane in a dosage of 1.3 g per m^2 or dieldrin in a dosage of 0.5 g per m^2. These products have been applied once, twice, or three times a year. Weaker doses of DDT (1 g per m^2) have been used in Yugoslavia. Some countries, such as Romania and Bulgaria, began by treating the highly endemic zones before dealing with the outlying low endemicity regions, while other countries attacked from the outset all the inhabited areas in a given zone.

In addition to the mass spraying method, Romania and Bulgaria experimented—first of all on a small scale and then extending the experiment to whole regions—with a system of barrier spraying on the boundaries of the large populated centres or in the outlying zones with low endemicity, sometimes suspending spraying in zones where no cases had been notified for two or three years.

In the zones of Romania and Bulgaria where malaria is only sporadic, and where mass spraying operations have been suspended, " focus " sprayings (" selective " method) are also effected. This method consists of applying insecticide to a house where there is a patient and to four or five neighbouring houses.

In all the countries represented at the conference, antilarval measures have been adopted in addition to spraying with chlorinated residual insecticides. The same products are used for larval control, and aircraft are sometimes employed for antilarval operations, particularly in Greece. The larval control method is generally reserved for the treatment of large expanses of water, as in marshes or rice fields; it has not been applied on a large scale except in Greece. In the possible event of anopheles' developing resistance, account should be taken of the fact that chlorinated insecticides have been fairly widely used in agriculture by several of the countries concerned, particularly during the last few years, and that anopheline larvae have probably been in contact with them.

Sanitation of watercourses and swamps has also been undertaken in the countries represented at the conference. The measures

adopted have been designed to meet the requirements of agriculture rather than those of malaria control; but they have nevertheless helped to achieve good results by reducing the source of infection, particularly in Bulgaria.

Extension of the rice fields, which presented a danger before the introduction of insecticides, can today be authorized; but care must naturally be taken when new rice fields are created to avoid increasing the potential sources of infection of a region. This principle applies equally to large-scale hydraulic works and to irrigation systems.

Chemotherapy is practised in all the countries concerned, with the various drugs available; schizontogametocytocidal treatment is the most usual. The dosage is practically the same everywhere, but treatment schedules differ from country to country. In Albania and Bulgaria, former patients are given " anti-relapse " treatment in the spring. In Bulgaria this treatment is followed by suppressive therapy up to the end of the malaria season. In Romania, all new cases and all malaria patients registered during the preceding year (new cases or relapses) undergo schizontocidal treatment from April to October, followed, throughout the whole of the malaria season, by suppressive treatment.

In Albania, Romania, Turkey, and Yugoslavia, chemoprophylaxis has been applied to certain population groups particularly exposed to the risk of infection because of their occupation, and to organized communities in malarious zones (employees in big workyards, members of the armed forces, schoolchildren, etc.). A weekly dose of mepacrine (Acrichine), proguanil (Paludrine), or chloroquine is distributed. In some countries chemotherapy has also been applied to pregnant women and nursing mothers.

In each country malaria control is the responsibility of a national service attached to the department of public health, though often decentralized in so far as field operations are concerned. Co-ordination committees, advisory committees, or expert committees (working independently, as in Yugoslavia and Greece, or in collaboration with parasitology and malariology institutes, as in Romania and Bulgaria) ensure the uniformity of programmes, epidemiological methods, and operations, or, as in Turkey and Greece, confine themselves to epidemiological research and the training of personnel.

The conference participants expressed the fear that as soon as malaria has been eliminated health administrations may demobilize their malaria-control services. They emphasized that such services should not be dissolved as the tasks to be fulfilled decrease, but should be called upon to undertake new health activities.

Resistance to insecticides

Among the countries represented, only Greece has reported cases of anopheline resistance to insecticides. In September 1951 *A. sacharovi* was found to be resistant to DDT. In 1952, the same species had developed resistance to chlordane. At the present time, resistance seems to be developing in other species (*A. maculipennis* and *A. superpictus*), but this cannot be confirmed until a study now in progress has been completed.

Epidemiological surveillance

Forms of epidemiological surveillance vary from country to country. In Greece, an active watch is kept over villages known to be malarious; they are visited by inspectors every 10, 20, or 30 days according to the gravity of the threat to the village. Inspectors are required to detect suspected cases of malaria, to take blood samples for haematological examination, and to administer treatment, which is continued if the result of the analysis is positive. These inspectors are also responsible for periodic determination of the anopheline density in their zones.

In other countries, cases of malaria are usually detected and registered either at dispensaries or by health personnel in their visits to homes.

In either case, epidemiological investigations are also carried out. In Romania, for example, imagocidal operations in a village must not be suspended unless at least 80% of the population of all age-groups have been examined for splenomegaly and blood parasites. Any person found to be carrying parasites is registered on a card and the case subjected to epidemiological investigation; all the inhabitants of the same house and of neighbouring houses undergo haematological control.

In Bulgaria, a complete epidemiological survey is made of all villages in which there are more than three cases of malaria. The survey consists of interrogation of the whole population and analysis of the blood of all children under 14 years of age and of all the inhabitants of the houses adjacent to those of persons suffering from malaria.

Malaria eradication

It is evident that no country can safely interrupt operations with insecticides if there is, at its frontiers, a zone where malaria is not controlled or where gametocyte carriers and infected anopheles are present. In response to the wishes of all delegations present, the conference participants thought it desirable that measures be studied and adopted by which accurate information on the malaria situation in the common frontier zones might be regularly and rapidly obtained. Such information would make it possible for the countries concerned to take adequate steps.

During the period of the conference devoted to the final objective of eradicating malaria, the participants called attention to the necessity not only for the periodic exchange of epidemiological information, but also for the application of measures to ensure effective control in the frontier zones. This could be implemented by the adoption of bilateral agreements between the countries concerned.

It was noted with satisfaction that several participating countries had already established close co-operation and were exchanging information on malaria in frontier regions. Bilateral agreements already exist between the Kingdom of Greece and the Turkish Republic, and between the People's Republic of Bulgaria and the People's Republic of Romania. A wider agreement relating to communicable diseases in general (and therefore covering malaria) has been signed between the People's Republic of Bulgaria and the Federal People's Republic of Yugoslavia. A similar agreement is being prepared between the Kingdom of Greece and the Federal People's Republic of Yugoslavia.

Conference participants expressed the opinion that bilateral agreements were very effective instruments for the exchange of information. While it was for the respective governments to define the level at which information should be exchanged, the conference participants specifically proposed that this exchange be effected directly between the national health administrations.

The conference considered that a "protective zone" to a depth of about 20 km should be established on each side of the frontiers, within which similar steps must be taken, including the compulsory notification of all cases of malaria, epidemiological investigation of each case, and the haematological examination of blood samples from patients, persons living in the same house as the patient, and persons living in neighbouring houses. Monthly reports indicating new cases detected in the zone during the month should be exchanged between countries signatory to bilateral agreements, and the appearance of micro-foci should be notified immediately by telegram.

The Bulgarian delegation, on the basis of its experience, proposed that in the protective zones all cases of malaria should, in so far as possible, be hospitalized and undergo compulsory treatment consisting of a period of therapy followed by clinical prophylactic (" suppressive ") treatment or anti-relapse treatment. All suspected cases should be treated as well and should be haematologically controlled three times during the first year and once, in the spring, in the following year. While they should not be compulsorily notified, suspected cases should, nevertheless, be entered in a special register. The " focus " and the " para-focus ", i.e., the patient's home and the neighbouring houses, would have to be sprayed with insecticides.

The conference participants expressed the wish that research on the susceptibility of anopheles to insecticides should be undertaken in each country, employing uniform and comparable methods. Bilateral agreements should provide for the immediate notification of any development of resistance to insecticides on the part of the insect vectors.

As an example of a bilateral agreement, attention was drawn to a protocol signed on 20 and 21 July 1955 by the representatives of the Government of Greece and the Government of Turkey. This protocol provides for a regular exchange of information on malaria control in both countries and particularly in the Evros River frontier zone. It also provides for reciprocal visits to the sites of the technical operations and for monthly meetings of a permanent Graeco-Turkish committee on malaria control in the Evros area.

Further, in view of the fact that air-spraying of larval breeding places is a widely applied practice in Greece, the agreement provides that Greece shall be responsible for larval control in certain breeding areas (marshes and rice fields) in Turkish territory, the evaluation of the malaria control operations to be made by the Turkish health authorities.

Greek and Turkish experts have agreed that in a zone extending 10 km on each side of the frontier the malaria-control measures applied in the rest of both countries will be very strictly applied, including epidemiological inspection of all villages in the " protection zone " to be undertaken every 10, 20, or 30 days according to the presence or absence of malaria or the extent to which the village is threatened. Personnel responsible for these inspections must make an active search for suspected cases of malaria, treat them immediately with schizontogametocytocides, and have the blood of the suspected persons subjected to laboratory examination.

The information referred to in the protocol must include data on the number and location of confirmed cases, anopheles density ascertained by the same method, malaria index, and, of course, any important details with regard to the malaria-control operations.

* * *

The conference participants expressed their satisfaction with the results achieved at the Belgrade meeting and suggested that other conferences be convened periodically to discuss the following points :

(*a*) results of the implementation of measures proposed at the Belgrade conference;

(*b*) residual transmission foci and methods to be adopted for their extinction ;

(*c*) data on the sensitivity of vectors to insecticides.

During such meetings there would be a general exchange of information on the development of malaria-control programmes in progress. The hope was expressed that WHO would collaborate in the organization of these meetings.

SEVENTEENTH SESSION OF THE EXECUTIVE BOARD

The WHO Executive Board held its seventeenth session, in Geneva, from 12 January to 2 February 1956, under the chairmanship of Dr S. Al-Wahbi, Director of Karkh Hospital, Baghdad, Iraq. Dr O. Vargas-Mendez (Costa Rica) and Dr S. Anwar (Indonesia) were elected Vice-Chairmen; Dr A. da Silva Travassos (Portugal) and Dr J. J. du Pré le Roux (Union of South Africa) were the Rapporteurs. A meeting of the Standing Committee on Administration and Finance preceded this session of the Board.

Some sixty items were included on the agenda. The Board was particularly concerned with the programme and budget for 1957 and the question of resumption of active membership in the Organization by the USSR. It considered, among other matters, the situation created by the resistance of insects to insecticides, WHO's programme relative to atomic energy and its implications for public health, increasing efforts to control leprosy, and the establishment in different parts of the world of registry centres for pathological tissues.

Programme and budget for 1957

The Board approved the programme of activities for 1957 proposed by the Director-General. After several days of discussion, it decided to recommend to the Ninth World Health Assembly an effective working budget of $11 000 000 for 1957, this sum representing an increase of about $800 000 over the budget for 1956 and $440 000 less than had been proposed by the Director-General. United Nations Technical Assistance funds are expected to provide $5 300 000, if governments request the health projects which have been negotiated.

The Board also recommended that, in the event that the number of Member States actively participating in the work of WHO should increase, the effective working budget should be increased by a maximum amount of $1 525 000.

Participation of the USSR in the work of WHO

In February 1949, the USSR, which had signed the WHO Constitution in 1946 and had become a Member of the Organization in 1948, informed WHO that it no longer considered itself a member. Similar action was taken by Albania, Bulgaria, the Byelorussian SSR, Czechoslovakia, Hungary, Poland, Romania, and the Ukrainian SSR. Since the WHO Constitution makes no provision for withdrawal from membership, these Members were subsequently considered "inactive".

Reiterating a statement made by the representative of his country before the United Nations Economic and Social Council in June 1955, Dr N. Khmelev, Deputy Minister of Health of the Soviet Union, announced to the WHO Executive Board that his country was prepared to participate again in the work of the Organization in order to collaborate more fully in international health activities. Several of its members expressed the Board's pleasure at the USSR's decision to take an active part in the work of WHO. They said that the support of the Soviet Union would represent a valuable asset from which all Member States would benefit, and that resumption of active participation by the USSR and the other eight countries would make the Organization almost universal in its membership.

The financial aspects of participation by the USSR and other Members in the same position—particularly the question of arrears of contributions—will be studied by the Ninth World Health Assembly.

Atomic energy and protection against radiations

The Board reviewed the new developments in international activities relative to the peaceful uses of atomic energy and the consequences of the use of this form of energy on the public health.

The General Assembly of the United Nations decided to prolong the activity of the Advisory Committee which was charged with the organization of the Conference on the Peaceful Uses of Atomic Energy, held in Geneva in August 1955, and to establish a sub-committee on atomic energy within the Administrative Committee on Co-ordination, in which the specialized agencies interested in atomic energy problems will be represented. In addition, it set up a scientific committee, composed of representatives of 15 countries (including Japan), to deal not only with the problems involved in the peaceful uses of atomic energy, but also with the effects of atomic radiations on the human organism. This committee will receive and distribute information on observed levels of radiation and on the effects of radiation on man and his environment. Co-ordination will be assured between the committee and the international agencies concerned with these questions.

WHO proposes to extend in 1956 the relevant activities undertaken in 1955, these consisting largely of collecting information on the nature and scope of problems associated with the use of atomic energy, on the sources of advice available to the Organization, and on the laws and regulations in force in various countries with regard to protection against radiation. The programme will include, in particular:

1. The training of personnel. An increasing demand, throughout the world, for personnel specialized in the application of atomic energy will require training of workers of different types: (*a*) specialists responsible for protection against radiation hazards in laboratories and in industry—a group which will bcome more and more essential (especially in countries in which research has been in progress for several years) as the applications of atomic energy spread beyond the specialized industries and laboratories and enter into everyday use in already existing factories; (*b*) public health administrators familiar with the problems of radiations, who will be called upon to give advice on the siting of reactors and the disposal of radioactive wastes; (*c*) medical personnel and radio-physicists trained in the therapeutic and diagnostic uses of radio-isotopes—a group which will find an increasingly wide field of activity, particularly in the less-developed countries where these methods are yet to be introduced into medical practice.

WHO has already awarded several fellowships for the training of these different types of personnel. Under the auspices of the Regional Office for Europe, a first course for " health physicists " was given in Stockholm in 1955; other courses of similar nature are being planned.

2. In 1956, WHO plans to take advantage of the meeting of the International Congress on Human Genetics, which will take place in Copenhagen, to convene a study group to investigate the problems connected with the effects of radiation on human heredity and to attempt to define a programme of work at the international level.

3. The eventual standardization of radiation units and of the methods of describing radiation doses and the possibility of extending the principles of biological standardization to radioactive substances will also be considered by a group of consultants convened by WHO, in consultation with the International Commission on Radiological Protection and the International Commission on Radiological Units.

Resistance of insects to insecticides

The situation created by the resistance of insects to insecticides in general, and by anopheline resistance in particular, which for several years has been actively studied by WHO, has been steadily deteriorating, according to a report presented for the Board's consideration. In Greece, Panama, Saudi Arabia, and the USA, various species of anophelines have developed an appreciable resistance to the chlorinated hydrocarbons. To destroy a certain strain of *Aëdes aegypti* in Trinidad, it is now necessary to use 2.0 p.p.m. of DDT, as compared with 0.004 p.p.m. for a normal susceptible laboratory colony. A survey made by WHO during the past three years in 70 countries on the resistance of lice to insecticides has revealed that in five countries resistance to DDT has been established. House-flies have become almost universally resistant to the halogenated insecticides; and, according to a recent report from Denmark, strains resistant to the organic phosphorus insecticides have now been isolated. The situation is the same with regard to certain species of fleas. Thus, it is not just the control of malaria which is at stake, but also the control of other epidemic diseases, such as yellow fever, typhus, and plague.

According to technical papers presented to the Board, it would be scarcely realistic to hope that the development of new insecticides will solve this problem in the near future. The few products recently proposed are more dangerous to man than DDT or BHC.

There is a need for many more research programmes. Insufficient funds, drawn from budgets for insect control, have been devoted, up to the present time, to research on the biological action of insecticides and on the nature of insect resistance to them. This neglect may, in the long run, jeopardize the control of certain diseases. Few laboratories are adequately equipped to undertake work on all aspects of the problem of insect resistance. Collaboration among laboratories can doubtless be effected, however. Rapid dissemination of information between field stations and laboratories, as well as among the laboratories themselves, would be an essential condition for successful study of this problem.

The Executive Board approved the relevant sections of the programme for 1956 and 1957, including surveys of the research being performed in different parts of the world; meetings of the Expert Committee on Insecticides, composed of biologists, malariologists, epidemiologists, and chemists; a meeting of the directors of laboratories collaborating in pertinent research programmes; and the drawing-up of recommendations for the guidance of Member governments on the future use of insecticides.

Large-scale leprosy-control campaigns

" The control of leprosy as a public health measure—both as regards new control methods and treatment—has reached a stage where considerable progress can now be made," declared one member of the Executive Board. Since 1950, WHO has been concerned with the problem of leprosy. A committee of experts convened in 1952 drew attention to the efficacy of the sulfones in the treatment of this disease and to the need for a new approach in its control:

> The more effective modern treatment giving better chances of recovery calls for a reconsideration of existing practices regarding compulsory isolation. While the rule of isolation of infectious cases may still be retained, the method of applying the rule may be modified so that the patient may be attracted to come forward earlier for treatment. . . .
>
> The change would bring the practice regarding leprosy more into line with that used in tuberculosis, a much more infectious and more often fatal disease, and contribute to the disappearance of the unreasoning horror attached to leprosy.[1]

In recent years WHO has published information on the legislation on leprosy which is

[1] *Wld Hlth Org. techn. Rep. Ser.*, 1953, **71**, 9-10

in force in different countries, provided expert advice and consultant services to nine countries, and participated in control campaigns in seven others.

It is estimated that there are 10 to 12 million persons suffering from leprosy in the world. The number of patients seeking care has increased in recent years, thanks to the encouraging results of more humane and more effective treatment. For example, in French Equatorial Africa, plans are being made to treat, with WHO aid, 125 000 patients in 1956, as compared with 80 000 in 1955; in Nigeria, the number is expected to be 195 000, as against 80 000 in 1954.

The Board emphasized that much remains to be done, and it recommended to the Health Assembly that the regional directors be encouraged to step up leprosy-control efforts and to undertake new programmes.

Establishment of registry centres for pathological tissues

A proposal was made to the Executive Board to extend its network of facilities for biological standardization and for the exchange of information on various diseases to the study of pathological tissues, cancer tissues in particular. Although knowledge of the distribution of cancer has been advanced, there remain certain phenomena which have been observed in different parts of the world and the study of which might shed some light on the etiology of the disease. Better understanding of the application of definitions is also necessary. Unknowns of the same type exist with regard to other diseases.

WHO could designate a number of reference centres which would assist national institutions and services in the diagnosis and definition of pathological tissues. It is possible that certain laboratories undertaking this work would be connected with medical schools, and the programme would thus be of benefit to medical education. The application of this method of study to cancer is already being developed.

The Board accepted this proposal and asked the Director-General to study what further action might be taken.

Malaria eradication special account

The first two voluntary contributions to the special account for combating malaria which was created by the Eighth World Health Assembly to promote malaria eradication campaigns were acknowledged by the Board: a contribution of approximately $10 000 from Brunei, and material valued at some $4000, given by China. A committee made up of five members of the Executive Board has been selected to accept certain voluntary contributions as may be offered and to give advice on the use of the fund and on means of obtaining voluntary gifts from official and private sources.

MORTALITY FROM DIPHTHERIA

Diphtheria is on the decline throughout the world; and, provided that the means available for its control are properly utilized, there is no doubt that it can rapidly cease to be a public health problem. Evidence of this is provided in a series of statistical tables published by WHO which show how mortality from diphtheria has been steadily decreasing since the beginning of the twentieth century in the 36 countries or territories covered by the study.[1]

[1] *Epidem. Vital Statist. Rep.*, 1955, **8**, 524-541

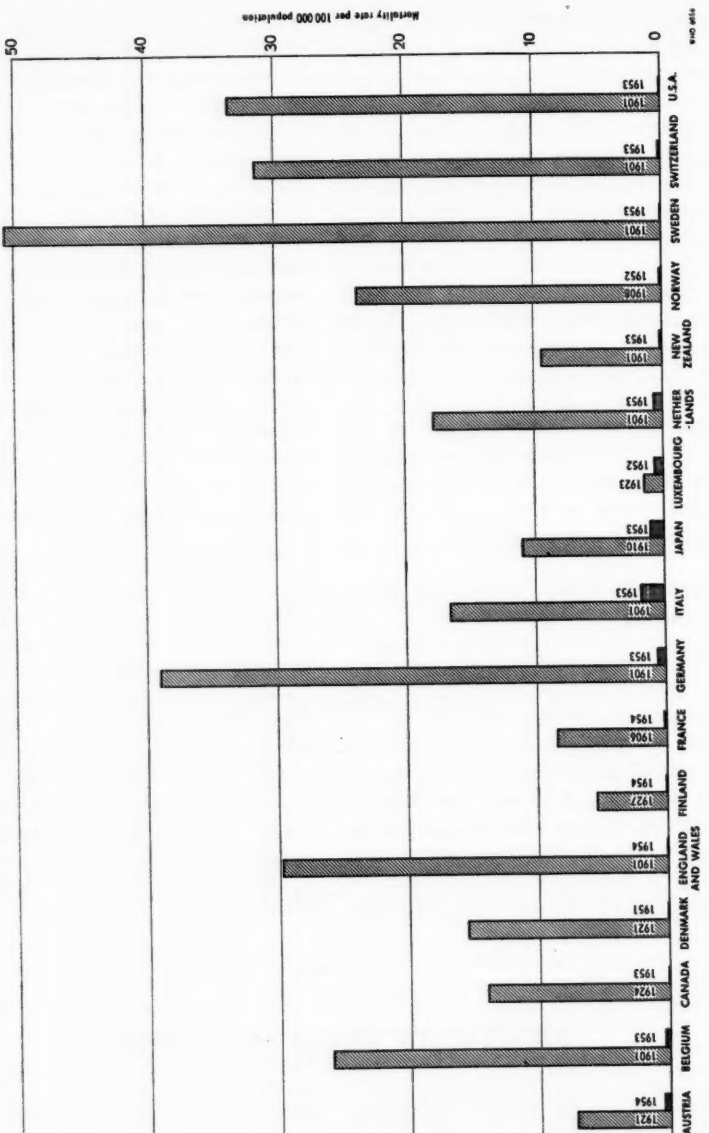

FIG. 1. MORTALITY FROM DIPHTHERIA

The development of antidiphtheria serum at the end of the nineteenth century made it possible to save an increasing number of lives of those stricken with the disease, but it was not until after the First World War that the introduction of antidiphtheria vaccine and improvements in immunization methods led to a considerable drop in diphtheria mortality. The data which follow (see also Fig. 1) illustrate the striking decline in a number of countries.

Country	*Year*	*Deaths from diphtheria*	*Mortality rate per 100 000 population*
Australia	1901	433	11.4
	1953	51	0.6
Austria	1921	470	7.2
	1954	29	0.4
Belgium	1901	1 750	26.0
	1953	27	0.3
Canada	1924	1 281	14.0
	1953	15	0.1
Denmark	1921	510	15.5
	1951	1	0.1
England and Wales	1901	9 761	29.8
	1954	9	0.1
Finland	1927	186	5.5
	1954	4	0.1
France	1906	3 314	8.4
	1954	67	0.2
Germany	1901	27 741	39.1
	1953	277	0.6
Italy	1901	5 444	16.7
	1953	857	1.8
Japan	1910	5 435	11.0
	1953	773	1.0
Luxembourg	1923	4	1.5
	1952	2	0.7
Netherlands	1901	931	17.8
	1953	73	0.7
New Zealand	1901	72	9.3
	1953	3	0.2
Norway	1908	555	23.7
	1952	6	0.2
Sweden	1901	2 617	50.8
	1953	1	0.1
Switzerland	1901	1 052	31.5
	1953	10	0.2
USA	1901	6 782	33.5
	1953	156	0.1

The downward trend continued until the Second World War, when a recrudescence of diphtheria was experienced in many of the countries (particularly in Europe) directly involved in the conflict or bearing the consequences of the hostilities, as the following data indicate.

Country	*Year*	*Mortality rate per 100 000 population*
Austria	1939	9.6
	1945	29.3
Belgium	1940	4.8
	1943	11.9
Denmark	1941	0.6
	1945	7.2
Finland	1939	5.9
	1944	30.8
France	1940	3.9
	1945	8.7
Germany	1938	9.6
	1946	19.2
Japan	1940	6.6
	1945	11.2
Luxembourg	1940	0.3
	1944	25.2
Netherlands	1939	0.9
	1945	26.1
Norway	1939	0.1
	1943	24.7

The WHO publication also points out the fact that it is at the age of 4 years that diphtheria generally represents the most serious threat to the health of children:

Country	*Proportion (%) of deaths from diphtheria in relation to general mortality (all causes), 1951-53*	
	Children under 10 years old	*Children 4 years old*
Australia	0.6	3.4
Canada	0.1	0.8
Finland	0.2	1.7
France	0.2	1.2
Italy	1.2	7.5
Netherlands	1.7	9.7
New Zealand	0.1	1.8
Norway	0.1	1.0
United Kingdom	0.1	0.8
USA	0.1	0.9

The statistics published by WHO bear witness to the efficacy of diphtheria immunization and emphasize the importance of its widespread application.

Notes and News

Symposium on Venereal Diseases and Treponematoses

The World Health Organization and the U.S. Public Health Service are jointly sponsoring an international symposium on venereal diseases and the treponematoses, to be held in Washington, D.C., USA, from 28 May through 1 June 1956.

This symposium is intended to provide an opportunity for an international exchange of ideas and information on the latest developments in research, diagnosis, treatment, and case-finding of the venereal diseases and treponematoses. The agenda will cover topics such as the following: Control of Venereal Diseases and the Treponematoses in Retrospect and Prospect; Reporting and Statistical Problems; Natural History of Syphilis and the Treponematoses; Experimental Syphilis and the Treponematoses; Serology and Immunology of the Treponematoses; Diagnosis, Management, and Prognosis of the Treponematoses and the Venereal Diseases; Gonorrhea, the Minor Venereal Diseases, and Non-Gonococcic Urethritis; Epidemiology and Control Techniques; Health Education and Public Information; Voluntary Agency Co-operation in Control Programmes.

The symposium is open to all physicians, scientists, and professional health workers interested in participating. It is expected that, before or after the symposium, participants will visit research, evaluation, or operating projects being carried out in the USA.

Seminar on Public Health Laboratory Aspects of Virus and Rickettsial Diseases

In the shifting pattern of communicable disease, virus and rickettsial diseases are assuming relatively greater importance. Accordingly, public health departments and their laboratories are being increasingly called upon to render services in this domain to virologists, practising physicians, and research workers.

The WHO Regional Office for Europe is planning a ten-day seminar on the public health laboratory aspects of virus and rickettsial diseases, to be held in the Escuela Nacional de Sanidad, Madrid, from 16 to 25 April 1956. The programme includes laboratory demonstrations as well as discussions led by experts, and is designed to bring out the public health aspects of the virus and rickettsial diseases, from both the technical and the administrative points of view. In recent years, new and simplified techniques for the laboratory diagnosis of virus and rickettsial diseases have been developed. A public health laboratory can begin work in this field without the acquisition of extensive and expensive equipment.

The seminar is intended for public health workers, especially those from public health laboratories, to assist them in either strengthening or developing virus and rickettsial disease sections within public health laboratories. The participants are expected to include 23 from the European Region, 11 from the African Region, and 3 from the Eastern Mediterranean Region.

The seminar consultants are: Dr F. Perez Gallardo, Escuela Nacional de Sanidad, Madrid; Dr P. Lépine, Institut Pasteur, Paris; Dr F. O. MacCallum, Virus Reference Laboratory, Public Health Laboratory Service, London; and Professor M. Michael Sigel, University of Miami, Miami, Fla.

Yellow Fever Study Tour

Upon invitation from WHO, leading public health and laboratory authorities from Europe, Asia, and Africa spent three weeks in February 1956 visiting several countries of the Americas to study at first hand the conditions under which yellow fever occurred

in recent years at several points in the Americas.[1] Particular subjects of observation were the epidemiological and quarantine aspects of yellow fever, the manufacture and application of 17-D yellow fever vaccine, and the methods employed in efforts to eradicate *Aëdes aegypti*.

The tour was conducted by Dr J. Austin Kerr, Special Adviser on Yellow Fever to the Pan American Sanitary Bureau, which acts as Regional Office of WHO. The participants visited the following countries: USA (study of quarantine measures at the international airport in Miami); Cuba (*Aëdes aegypti* eradication operations in Havana and neighbouring towns); Honduras and Costa Rica (sites of recent outbreaks of jungle yellow fever); Panama (research at the Gorgas Memorial Laboratory and field work concerning species of jungle mosquitos that carry the disease in tropical forested areas); Colombia (production of vaccine and research at the Carlos Finlay Institute in Bogotá, and field trip to the Magdalena River Valley); Trinidad (research at the Trinidad Regional Virus Laboratory in Port-of-Spain, field work); Brazil (National Yellow Fever Service Regional Office and Virus Laboratory in Belem, and the National Yellow Fever Service in Rio de Janeiro).

Those participating in the tour were: Dr S. Anwar, Inspector General of Health of Indonesia; Dr J. C. Azurin, Director of Quarantine, Department of Health of the Philippines; Dr C. Courtois, Director of the Medical Laboratory, Stanleyville, Belgian Congo; Dr A. J. Haddow, Director of the East African Virus Research Institute, Entebbe, Uganda; Dr A. Halawani, Director-General of the Department of Endemic Diseases of the Egyptian Health Ministry; Dr C. G. Pandit, Secretary of the Indian Council of Medical Research, Ministry of Health of India; Dr A. R. Qattan, Assistant Director-General of the Department of Preventive and Social Medicine, Ministry of Health of Iraq; Dr M. A. Vaucel, Inspector-General of the Overseas Pasteur Institutes, Paris, France; and Dr I. Fang, Director of the WHO Regional Office for the Western Pacific, Manila.

[1] See *Chron. Wld Hlth Org.*, 1956, 10, 39.

Pnompenh Malaria Conference

A conference similar to the one held in Belgrade [2] took place in Pnompenh from 10 to 12 January 1956, under the auspices of WHO and with the participation of delegates from Cambodia, Laos, Thailand, and Viet Nam. The participants unanimously recommended the creation of an antimalaria co-ordination board.

In advising the setting-up of this body, it was the intention of the four countries to facilitate not only joint development of their malaria-control programmes, but also collaboration in efforts to eradicate the disease from this part of Asia. Each country will send a representative to periodic meetings of the board. WHO has been asked to supply the necessary technical services and secretariat.

The conference participants were of the opinion that malaria-control co-ordination should cover, in particular, the nature of the campaign to be undertaken, the delineation of the zones to be treated, and the synchronization of operations. Emphasis was also laid on the necessity for extending these collective activities over a still wider regional area in order to include outlying territories which are also malaria-infested. The Antimalaria Co-ordination Board will therefore welcome any neighbouring state which may express a desire to become a member.

Several recommendations for the intensification of malaria-control efforts were adopted at the conference. These were especially concerned with the strengthening of malaria-control services, exchange of information among such services, improvement of statistics, standardization of control methods, and implementation of vigorous health education programmes.

Seminar on Environmental Sanitation in Africa

Environmental sanitation methods and techniques developed in the economically

[2] See p. 73 of this number of the *Chronicle*.

advanced countries are not necessarily of value in under-developed regions. Often the people of these regions, especially in the rural areas, stick to their habits and traditions and are completely unaware of the benefit they might derive from improvement of the sanitary conditions in which they live.

In organizing a seminar on environmental sanitation in Africa, WHO invited specialists, medical officers, engineers, and health educators, not only from Africa, but also from Europe and the Americas, to re-examine the problem of environmental sanitation in Africa in the light of the experience gained, and to suggest measures sufficiently general in nature to be applied under the varying conditions existing on the continent. This seminar was held, under the auspices of the Government of Western Nigeria, in Ibadan, from 12 to 17 December 1955. Médecin-Général M. A. Vaucel, Inspector-General of the Overseas Pasteur Institutes (France), acted as Chairman.

Starting from the premise that it is always possible to do something to improve environmental conditions, whatever the circumstances and the financial means at hand, the seminar participants expressed the opinion that any relevant policy must include: (*a*) the establishment, within the health services, of a section on environmental sanitation which would be responsible for evaluating the needs and resources of the different areas, formulating plans of work, and directing such work; (*b*) the inclusion of projects in environmental sanitation in public health programmes, assigning priorities and determining suitable starting-points; and (*c*) the development of a long-range plan for improvement of environmental sanitation throughout the country.

The participants emphasized the fact that no progress could be realized without the co-operation of the people. It would be useless to insist upon the installation of sanitary facilities which would surely never be utilized. It is essential to obtain popular support from the very beginning. A good method consists of establishing demonstration zones which the people can visit and from which they can draw useful comparisons. It is also a good technique to ask them to collaborate actively in the work; any community, regardless of how poor it may be, is capable of furnishing some material and the necessary labour.

The task of the health educator is obviously of primary importance in these regions. In this connexion, the conference participants recognized the influential role of the African woman in the life of the community: the ultimate success of any effort to improve environmental conditions in Africa will depend upon her collaboration.

BCG Vaccination in India

WHO and UNICEF have assisted in the implementation, in many parts of the world, of BCG vaccination programmes for the protection of young people against tuberculosis. In India the operations have been on an impressively large scale, and they are still under way. The latest report discloses that, since the beginning of the campaign in July 1951, about 63 million young persons have been examined and about 22 million have been vaccinated. At the end of 1955, 128 vaccination teams were operating in India.

Tuberculosis Control in Turkey

The Turkish health authorities have, since 1948, been engaged in a mass BCG vaccination programme; for the past three years, this work has been assisted by WHO and UNICEF. About 9 million persons—nearly half of the population of Turkey—have already been tuberculin-tested; and, of these, about 44% have given a negative reaction. Approximately 98% of the negative reactors have been vaccinated.

The BCG vaccine used in the campaign is produced by the Refik Saydam Central Institute of Hygiene in Ankara. In December 1955 about 46 litres of vaccine were produced. In the same month, the Institute also prepared 90 litres of tuberculin (PPD) from stock solutions of tuberculin purchased in Copenhagen for the Institute by UNICEF.

Role of the Bat in the Transmission of Rabies

Since 1911 it has been known that vampire bats in Central and South America transmit rabies. In the USA, even bats normally feeding on insects and fruit have been shown to be infected with rabies; since 1953, about 100 infected bats have been reported, and three of these had bitten human beings. In Germany, where 100 to 200 rabid animals of various kinds are reported monthly, it is also suspected that the disease exists in bats. Last year a man in India was bitten by a bat and subsequently died of rabies. The latest report associating bats with rabies has come from Yugoslavia, where the Pasteur Institute of Novi Sad has confirmed, by laboratory examination, the presence of rabies virus in bats captured locally.

Rabies still claims many victims throughout the world. If it is confirmed that bats—which are found in all latitudes—constitute a significant reservoir of the virus, the eradication of rabies will be a difficult problem.

Bat surveys are being encouraged by WHO in a number of countries so that more information on the role of the bat in the transmission of rabies may become available.

Review of WHO Publications

Bulletin of the World Health Organization, 1956, Volume 14, Number 1 (pages 1-186).

A wide variety of subjects is dealt with in this number of the *Bulletin*.

The first article, by Naguib Ayad, is a comprehensive report on a survey of bilharziasis and its vectors in certain countries of north-east Africa and of the Red Sea area (British Somaliland, Eritrea, Ethiopia, Somalia, the Sudan, and Yemen) and a review of the somewhat scattered and incomplete information on this subject already available in the literature. The author draws attention to the danger of a spread of bilharziasis from highly endemic regions to those where its prevalence is still slight, because of irrigation works, construction of roads and consequent intensification of traffic, and movements of agricultural workers. He emphasizes the importance of the necessary legislative measures, which must be supported by a population well informed about the etiology of the disease.

A search for neutralizing antibodies of poliomyelitis was made among certain Pygmy and Negro peoples in the Belgian Congo. A study by G. Barski & P. Lépine reveals the presence, from a very early age, of antibodies corresponding to the three types of poliovirus in 80% to 100% of the Pygmies and Negro villagers from regions with good communications with the outside world. On the other hand, in regions less accessible, a large proportion of the sera were found to be negative, especially in children and even among persons up to the age of 20 years. The authors discuss the epidemiological significance of these observations.

Improved research techniques in poliomyelitis are the subject of two articles: Joseph L. Melnick & Edward M. Opton describe the use of disposable plastic panels in the colorimetric assay of poliomyelitis neutralizing antibody, and Catherine Rappaport discusses an automatic method for the preparation of cell suspensions by the trypsinization of monkey-kidney tissue.

The stability of biological standards, which is the foundation of all biological standardization, is considered by N. K. Jerne & W. L. M. Perry, who demonstrate, by the indirect methods available, that the present standards are extremely stable.

The advantages of potassium iodate over iodide in the iodization of salt under difficult climatic conditions are brought out in a note by Guillermo Arroyave, Oscar Pineda & Nevin S. Scrimshaw.

CORRIGENDUM

VOL. 10, No. 1

PROPOSED INTERNATIONAL NON-PROPRIETARY NAMES (Prop. I.N.N.): LIST 4

Page 34, reserpine (eighth name), chemical description

delete alkaloid from the roots of *Rauwolfia serpentina Benth*

insert alkaloid from the roots of various species of *Rauwolfia*

World Health Organization: Technical Report Series No. 101

POLIOMYELITIS VACCINATION

A preliminary Review

Introduction

Experience with poliomyelitis vaccination in various countries

Safety testing

Selection of strains for inactivated poliomyelitis vaccine

Antigenicity tests

Theoretical complications of vaccination against poliomyelitis

Public health application of inactivated poliomyelitis vaccine under different epidemiological conditions

Live virus vaccines

Design and techniques of serological surveys

Conclusions

Annexes

Poliomyelitis vaccine antigenicity and potency tests

Selection of strains for inactivated poliomyelitis vaccine

Present status of work on immunization of human beings with living attenuated poliomyelitis virus

Studies of immunization of man against poliomyelitis with living attenuated virus

1956; 40 pages * Price: 1/9 $0.30 Sw.fr. 1.–

World Health Organization: Monograph Series No. 30

YELLOW FEVER VACCINATION

IMMUNOLOGY

Immunology of yellow fever—*Kenneth C. Smithburn*

DAKAR VACCINE

Preparation of yellow fever vaccine at the Institut Pasteur, Dakar—*C. Durieux*
Vaccination technique with yellow fever vaccine of the Institut Pasteur, Dakar—*C. Durieux*
Post-vaccination immunity with yellow fever vaccine of the Institut Pasteur, Dakar—*C. Durieux & R. Koerber*

17D VACCINE

Production of 17D yellow fever vaccine—*H. A. Penna*
Administration of 17D yellow fever vaccine, with special reference to Brazil—*H. A. Penna*
Vaccination by scarification with 17D chick-embryo vaccine —*G. W. A. Dick*
Time of appearance and duration of immunity conferred by 17D vaccine—*G. Courtois*

MASS VACCINATION

Mass yellow fever vaccination in French Africa south of the Sahara—*C. Durieux*
Mass vaccination against yellow fever in Brazil, 1937-1934— *Caio de Souza Manso*

POST-VACCINATION REACTIONS

Reactions following vaccination against yellow fever— *George Stuart*

INTERNATIONAL REGULATION

International regulation of yellow fever vaccination— *P. H. Bonnel*

Select bibliography

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1956; 238 pages, 37 figures * Price: £1 5s. $5.00 Sw.fr. 15.— (clothbound)